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Nadine Carozzi

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ALSTON & BIRD LLP

BANK OF AMERICA PLAZA

101 SOUTH TRYON STREET, SUITE 4000

CHARLOTTE, NC 28280-4000

EXAMINER

KUBELIK, ANNE R

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.		Applicant(s)	
	10/781,979		CAROZZI ET AL.	
	Examiner		Art Unit	
	Anne R. Kubelik		1638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11, 19 and 22-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11, 19 and 22-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 July 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-11, 19 and 22-36 are pending.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Objections

3. Claims 1, 26 and 29 are objected to because “and” is missing at the end of part (c).

Claim Rejections - 35 USC § 112

4. Claims 1-11, 19 and 22-36 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for nucleic acids encoding SEQ ID NO:3 and 5, host cells, plants, plant cells and seeds comprising them, and method of using them to make SEQ ID NO: 3 and 5, does not reasonably provide enablement for nucleic acids encoding SEQ ID NO:7, nucleic acids encoding pesticidal protein with 90% identity to SEQ ID NO:3, 5 or 7, nucleic acids with 90% identity to SEQ ID NO:1, 2, 4, or 6, host cells, plants, plant cells and seeds comprising them, and method of using them to make a pesticidal protein with 90% identity to SEQ ID NO:3, 5 or 7 and a pesticidal protein encoded by a nucleic acid with 90% identity to SEQ ID NO:1, 2, 4 or 6. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims. The rejection is repeated for the reasons of record as set forth in the Office action mailed 5 April 2007. Applicant’s arguments filed 2 July 2007 have been fully considered but they are not persuasive.

The claims are broadly drawn to nucleic acids encoding a pesticidal protein with 90% identity to SEQ ID NO:3, 5 or 7, nucleic acids with 90% identity to SEQ ID NO:1, 2, 4 or 6, or a complement of those nucleic acids, host cells, plants, plant cells and seeds comprising them, and method of using them to make a pesticidal protein with 90% identity to SEQ ID NO:3, 5 or 7 and a pesticidal protein encoded by a nucleic acid with 90% identity to SEQ ID NO:1, 2, 4 or 6.

The instant specification, however, only discusses sequencing of DNAs from non-publically available bacterial strain ATX13026 (examples 1-4), identification of a nucleic acid, SEQ ID NO:1, that encodes a protein, SEQ ID NO:3, with 66% identity to the delta endotoxin cry40Aa, and an alternate start site variant, SEQ ID NO:4, which encodes SEQ ID NO:5 (examples 5-6), identification of an open reading frame, SEQ ID NO:7, encoded by SEQ ID NO:6, downstream of SEQ ID NO:1 with identity to downstream open reading frames of other cry proteins (example 7); assay of SEQ ID NO:3 for pesticidal activity against *Trichoplusia ni* (cabbage looper) and *Tenebrio molitor* (yellow mealworm) (examples 8-11), and prophetic guidance for expression in plants (examples 12-14).

The instant specification fails to provide guidance for how to make nucleic acids encoding pesticidal protein with 90% identity to SEQ ID NO:3, 5 or 7 and nucleic acids with 90% identity to SEQ ID NO:1, 2, 4 or 6, or even towards which pests these nucleic acids would be pesticidal.

Nucleic acids encoding proteins with 90% identity to SEQ ID NO:3 or 5 would encode proteins with 69 amino acid substitutions. Nucleic acids with 90% identity to a 5980 nucleic acid like that of SEQ ID NO:1 would have 598 nucleotide substitutions, and thus encompass those that encode proteins with 598 amino acid substitutions; these proteins would have 13.7%

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identity to SEQ ID NO:3. Similarly, nucleic acids with 90% identity to a 2082 nucleic acid like that of SEQ ID NO:2 and a 2073 nucleic acid like that of SEQ ID NO:4 would have 208 and 207 nucleotide substitutions, respectively, thus encompassing those that encode proteins with 208 and 207 amino acid substitutions, respectively. Lastly, nucleic acids with 90% identity to a 1686 nucleic acid like that of SEQ ID NO:6 would have 168 nucleotide substitutions, thus encompassing those that encode proteins with 168 amino acid substitutions; these proteins would have 70% identity to SEQ ID NO:7.

The instant specification fails to provide sufficient guidance for which amino acids of SEQ ID NO: 3, 5 or 7 can be altered and to which other amino acids, and which amino acids must not be changed, to maintain the activity of the encoded protein. The specification also fails to provide guidance for which amino acids can be deleted and which regions of the protein can tolerate insertions and still produce a functional protein.

The guidance in the specification with respect to making amino acids substitutions in AXMI-008 is as follows:

The specification, in the paragraph starting on pg 14, line 15, says:

Amino acid substitutions may be made in nonconserved regions that retain function. In general, such substitutions would not be made for conserved amino acid residues, or for amino acid residues residing within a conserved motif, where such residues are essential for protein activity. Examples of residues that are conserved and that may be essential for protein activity include, for example, residues that are identical between all proteins contained in the alignment of Figures 1A, B, and C or 2A and B. Examples of residues that are conserved but that may allow conservative amino acid substitutions and still retain activity include, for example, residues

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that have only conservative substitutions between all proteins contained in the alignment of Figures 1A, B, and C or 2A and B. However, one of skill in the art would understand that functional variants may have minor conserved or nonconserved alterations in the conserved residues.

Conservative substitutions are defined on pg 13, line 25, to pg 14, line 2. A search of the originally filed Fig. 1, shows that there are no positions that are identical among all the proteins in the Figure, and 21 positions that have only conservative substitutions among all the proteins.

The specification on pg 13, lines 19-23 suggests that substitutions be made at amino acids that are not essential for biological activity, but does not teach any such amino acids.

The specification teaches the 4 of the 5 highly conserved regions among endotoxins in AXMI-014 (specification pg 4, lines 9-16); the regions encompass a total of 138 amino acids.

Thus, from the guidance in the specification, it would appear that the vast majority of the amino acids in SEQ ID NO:3 and 5 could be substituted.

However, although point mutations and substitutions of a few amino acids have been made in Cry proteins, no one has substituted up to 598 amino acids of a Cry protein, as encompassed the claimed nucleic acids.

Making amino acid substitutions in *cry* proteins is unpredictable. Each *cry* protein only has activity against one or few insect species (de Maagd et al, 1999, Appl. Environ. Microbiol. 65:4369-4374, see pg 4369, column 1, paragraph 1), and even conservative substitutions in nonconserved regions can have unexpected effects on protein function (Figs 2 and 3). Even a single amino acid substitution in a *cry* protein may alter its insecticidal specificity, and toxicity

must be determined empirically (Tounsi et al, 2003, J. Appl. Microbiol. 95:23-28; see pg 27, column 2, paragraph 2).

Aaronson et al (2001, FEMS Microbiol. Lett. 195:1-8) teach that there are extensive functional interactions between the three domains of Cry proteins and that more than one domain is involved in toxin specificity and binding (paragraph spanning the columns on pg 7). de Maagd et al (2001, Trends Genet. 17:193-199) teach that domains II and III are involved in insect specificity (pg 194, right column, paragraph 3) and that domains I and II have coevolved towards certain specificities (pg 196, left column, paragraph 2, and pg 197, left column, paragraph 4). De Maagd et al (2001) concludes that the determination of insect specificity of endotoxins is still not understood (pg 198, right column, paragraph 2).

Thus, extensive teachings are required for making nucleic acids encoding *Cry* proteins with up to 598 amino acid substitutions relative to SEQ ID NO:3 or 5, as encompassed by the claimed nucleic acids. These teachings are not provided for by the specification. The specification also fails to overcome the unpredictability of making large numbers of amino acid substitutions in *Cry* proteins by providing no working examples of proteins with up to 598 amino acid substitutions relative to AXMI-008.

The specification also suggests making the claimed nucleic acids by random mutagenesis (pg 14, line 27, to pg 15, line 2). However, Guo et al (2004, Proc. Natl. Acad. Sci. USA 101: 9205-9210) teach that while proteins are fairly tolerant to mutations resulting in single amino acid changes, increasing the number of substitutions additively increases the probability that the protein will be inactivated (pg 9209, right column, paragraph 2). Thus, making and analyzing

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proteins that have up to 598 random amino acid substitutions to find those that have pesticidal activity would require undue experimentation.

AXMI-008 has the most identity (66%) to a *cry* protein with toxicity to the dipteran mosquito (*cry40Aa*; see Ibarra et al, 2003, Appl. Environ. Microbiol. 69:5269-5274; abstract and Table 2). Its toxicity to Lepidopterans *T. ni* and the Coleopteran *T. molitor* suggests that AXMI-008 is a new class of *cry* toxin. Thus, given the novelty of AXMI-008 and the unpredictability making in amino acid substitutions in *cry* proteins, proteins with up to 598 amino acid substitutions relative to SEQ ID NO:3 or 5 would likely have a very different insect toxicity than AXMI-008, if such toxins could even be made. The specification does not teach the insect toxicity of such proteins. Therefore, one would not know how to use nucleic acids encoding proteins with up to 598 amino acid substitutions relative to SEQ ID NO:3 or 5.

The specification teaches that SEQ ID NO:7 has 86% identity to *cry40Aa orf2* and 85% identity to *cry39Aa orf2* and states that “these proteins also share homology to the C-terminal non-toxic domain of *cry4Aa* and *cry4Ba*” (emphasis added; pg 38, lines 9-10). Thus, one of skill in the art would not expect SEQ ID NO:7 to have any toxicity towards insects. Further, the specification does not teach how to make variants with 168 amino acid substitutions relative to SEQ ID NO:7, much less make variants with the same activity.

As the specification does not describe the transformation of any plant with a pesticidal protein with 90% identity to SEQ ID NO:3, 5 or 7, nucleic acids with 90% identity to SEQ ID NO:1, 2, 4 or 6, undue trial and error experimentation would be required to screen through the myriad of nucleic acids encompassed by the claims and plants transformed therewith, to identify those with insect resistance, if such plants are even obtainable.

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Given the claim breath, unpredictability in the art, undue experimentation, and lack of guidance in the specification as discussed above, the instant invention is not enabled throughout the full scope of the claims.

Applicant urges that the Office appears to be suggesting that Applicants provide support for making a protein with up to 598 amino acid substitutions without experimentation; however, the test is whether the necessary experimentation is routine or undue (response pg 9-10).

This is not found persuasive. Because of the lack of guidance in the specification, and because of the unpredictability of making amino acid substitutions in cry proteins taught by Aaronson et al, Angsuthanasombat, de Maagd et al, Tounsi et al, de Maagd et al, 2001, Jenkins, Rajamohan, Lee, Scharzt and Masson, making 598 amino acid substitutions in a 693 amino acid protein would require undue experimentation.

Applicant urges that undue experimentation is determined by weighing the *Wands* factors and *Wands* does not require a working example for every pesticidal peptide that could be used in the invention or a peptide with 598 amino acid substitutions (response pg 10).

This is not found persuasive because the breadth of the claims, the nature of the invention, the state of the art with respect to the knowledge of cry protein structure and function, the level of unpredictability in the art, the lack of guidance provided by the specification, the lack of working examples spanning the full scope of the claimed invention, and the quantity of experimentation all indicate that the amount of amount of experimentation require to make and use the full scope of the claimed invention would be undue.

Applicant urges that specification provides guidance by limiting the percent identity and

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requiring a function; guidance is provided on pg 9-15 and method for assay on pg 6 and 18-19 and examples 8, 9 and 11 (response pg 10-11).

This is not found persuasive. Limiting the percent identity of the claimed nucleic acid and requiring a function do not teach which amino acid substitutions may be made in the proteins. The guidance on pg 8-11 merely discusses fragment size, percent identity, and calculation of percent identity. However, guidance for determining percent identity does not teach the necessary and sufficient structural features of the claimed nucleic acids, and does not teach which amino acids could be substitutive with which other amino acids. Similarly, method of assay fail to teach which amino acids could be substitutive with which other amino acids. The guidance on pg 13-14 is discussed above; it fails to sufficiently teach which amino acid substitutions to make in SEQ ID NO:3, 5 or 7, given the unpredictability in making amino acid substitutions in cry proteins.

Applicant urges that one would only need to prepare variants and test them using routine methods; it customary to generate large numbers of variants using standard techniques (response pg 11-12).

This is not found persuasive. Doing so would require undue experimentation because the specification does not provide sufficient guidance as to which 598 amino acid substitutions can be made in SEQ ID NO:3. Thus, one would need to randomly make nucleic acids encoding proteins with up to 598 amino acid substitutions and test them. Because this would require trial and error experimentation and because of the likelihood of protein inactivation (see Guo et al, pg 9209, right column, paragraph 2) and the unpredictability of amino acid interactions in cry proteins (Aaronson et al, paragraph spanning the columns on pg 7; de Maagd et al, 1999, pg

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4369, column 1, paragraph 1; de Maagd et al, 2001, pg 194, right column, paragraph 3), this experimentation would be undue.

Applicant urges that that Genentech states that the specification must supply the novel aspects of the invention, and in Genentech no starting materials were disclosed, while here there is a working example and guidance (response pg 12).

This is not found persuasive. The instant rejection is a scope of enablement rejection; the invention is enabled for nucleic acids encoding SEQ ID NO:3 and 5. The specification, however, does not provide adequate guidance for making 208 or 598 amino acid substitutions in SEQ ID NO:3 or SEQ ID NO:5 or for how to use nucleic acids encoding SEQ ID NO:7 or make nucleic acids encoding proteins with 168 amino acid substitutions relative to SEQ ID NO:7.

Applicant urges that although the Court states that a “mere germ of an idea does not constitute an enabling disclosure” it also says that “[w]hile every aspect of a generic claim certainly need not have been carried out by an inventor, or exemplified in the specification, reasonable detail must be provided in order to enable members of the public to understand and carry out the invention” (response pg 12-13).

This is not found persuasive because the specification fails to provide the reasonable detail for making the nucleic acids within the full scope of the claims. Reasonable detail has not been provided in order to enable members of the public to understand and carry out the invention.

Applicant urges that the specification provides a starting material and extensive description on pg 14 and Fig 1 and 2 as to which amino acid substitutions can be done (response pg 13).

This is not found persuasive. The full scope of amino acids critical to the biological activity of SEQ ID NO:3, 5 and 7 are not taught in the specification on these pages or any other. The findings and teachings of Aaronson et al, Angsuthanasombat, de Maagd et al, Tounsi et al and de Maagd et al, 2001, as well as the references cited by Applicant (Jenkins, Rajamohan, Lee, Schartz and Masson) show that interactions between amino acids in Cry proteins is much more complex than can be predicted from guidance suggesting only making conservative substitutions. De Maagd et al (2001) specifically teaches that the determination of insect specificity of endotoxins is still not understood (pg 198, right column, paragraph 2).

Applicant urges that Amgen supports the enablement of the instant invention because there is not claim to all analogs, only ones within a specific percent identity (response pg 12).

This is not found persuasive. Amgen pg 1027 says: "Details for preparing only a few EPO analog genes are disclosed. Amgen argues that this is sufficient to support its claims; we disagree. This 'disclosure' might well justify a generic claim encompassing these and similar analogs, but it represents inadequate support for Amgen's desire to claim all EPO gene analogs." The instant specification provided no analogs of SEQ ID NO:3, 5 and 7, let alone ones with up to 598 amino acid substitutions. No similar analogs were provided in the instant case.

Applicant urges that in Amgen the Court acknowledges that disclosure of a few EPO genes justifies a claim encompassing those genes and similar analogs; likewise, disclosure of SEQ ID NO:s3, 5 and 7 justifies a claims to SEQ ID NOS: 3, 5 and 7 and analogs with 90% identity (response pg 13-14).

This is not found persuasive because the instant specification does not teach any analogs. SEQ ID NO:5 is merely a 3 amino acid shorter fragment of SEQ ID NO:3, and SEQ ID NO:7

has no relationship to either SEQ ID NO:3 or 5. No analogs within the full scope of the claims are taught.

Applicant urges that they do not presume that every conceivable conservative substitution in a nonconserved region will produce a protein with the recited activity, but rather that the methods for making an testing substitutions with 90% identity to SEQ ID NOs:3, 5 and 7 is routine and the experimentation is not undue (response pg 14).

This is not found persuasive because given the large number of substitutions encompassed by the claims, the low identity to cry proteins with toxicity to plant pests (especially as opposed to non-plant pests), and the unpredictability in the art, making a testing substitutions within the full scope of the claims would not be routine and would require undue experimentation.

Applicant urges that Guo's findings only suggest that a large number of substitutions were not produced by Guo et al, not that they could not be produced; further, the guidance in the specification does not require random substitution (response pg 14).

This is not found persuasive. Guo et al teachings indicate that making such a large number of amino acid substitutions would not routine. Further, the specification suggests making the claimed nucleic acids by random mutagenesis (pg 14, line 27, to pg 15, line 2). Guo et al points to the inadequacy of the guidance in the specification.

Applicant urges that Li et al and Morse et al teach detailed information about the structure of δ -endotoxins, which are very well characterized; these could be used to choose which 598 amino acids to substitute in the 693 amino acid protein to retain the structure of the resultant protein without making random modifications (response pg 15).

This is not found persuasive. Li et al do not provide guidance for making 208 or 598 amino acid substitutions in a 693 amino acid long protein; Li et al only provided guidance for making truncations and insertion of chymotrypsin cleavage sites. Neither Li nor Morse made 208 or 598 amino acid substitutions in their proteins. Additionally, the instant specification suggests making random substitutions in SEQ ID NO:3, 5 and 7 on pg 14, lines 27-30.

It is noted that the protein taught by Li et al is a cry3Aa protein, which the instant specification teaches has only 21% identity to SEQ ID NO:2 (Table 1), and that taught by Morse et al is a cry2Aa protein, which has 10% identity to SEQ ID NO:2. This is relevant because de Maagd et al, 1999, teach that that the crystal structure of Cry1C only allows for limited prediction of the structure of Cry1Aa (pg 4373, right column, paragraph 4), which by Crickmore's nomenclature system would have between 45% and 78% identity to one another. Thus, the teachings of Li and Morse would have provide only limited guidance to one making 208 or 598 amino acid substitutions in SEQ ID NO:3.

Applicant urges that one could choose regions that are conserved among cry proteins to find modifications within the structural parameters and assay them for retention of pesticidal activity (response pg 15).

This is not found persuasive because the regions conserved among cry proteins only provide very general for cry protein structure. They do not teach which amino acids substitutions to make to retain *T. ni* and *T. molitor* pesticidal activity of the protein.

Further, the claims encompass nucleic acids encoding proteins with 13.7% identity to SEQ ID NO:3. Because a *cry* protein with 66% identity to AXMI-008 as toxicity to the dipteran mosquito, which is not a plant pest, the claims encompass proteins that are not plant pests. Given

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the novelty of AXMI-008 and the unpredictability making in amino acid substitutions in *cry* proteins, proteins with up to 598 amino acid substitutions relative to SEQ ID NO:3 or 5 would likely have a very different insect toxicity than AXMI-008, if such toxins could even be made. The specification does not teach the insect toxicity of such proteins. Thus, one would not know how to use nucleic acids encoding proteins with up to 598 amino acid substitutions relative to SEQ ID NO:3 or 5.

Applicant urges that Aaronson et al, Angsuthanasombat, de Maagd et al 1999, Tounsi et al and de Maagd et al, 2001 support Applicant's assertion that making a testing substitutions is routine (response pg 16).

This is not found persuasive. de Maagd et al, 1999, for example, were surprised by many of the results (pg 4373, right column, paragraphs 2-3) showing that the residues have complex and unpredictable interactions with one another or with the insect receptor. This argues against Applicant's assertion that making the claimed nucleic acids would be routine.

Applicant urges that because claims to the nucleic acids are enabled, claims directed to transformation of a plant are enabled (response pg 16).

This is not found persuasive because, for the reasons detailed above, claims to the nucleic acids are not enabled.

Applicant urges that the specification establishes that SEQ ID NO:7 is a endotoxin-associated protein, and that these proteins either are toxins or act as helper or stabilizer proteins; (response pg 16).

This is not found persuasive because the specification does not teach how to assay SEQ ID No:7 or how to make nucleic acids encoding proteins with 168 amino acid substitutions

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relative to SEQ ID NO:7. Further, the specification states that “these proteins also share homology to the C-terminal non-toxic domain of *cry4Aa* and *cry4Ba*” (emphasis added; pg 38, lines 9-10), which suggests that SEQ ID NO:7 is not a toxin.

Applicant urges that Rosso et al provide specific assays for measuring endotoxin associated protein function, which is what the specification teaches SEQ ID NO:7 is on pg 6 (response pg 16-17).

This is not found persuasive. The specification does not teach for which cry proteins, if any, proteins with 70% identity to SEQ ID NO:7 would have helper or stabilizer function.

Applicant urges that SEQ ID NO:7 has a high degree of similarity to other endotoxin-associated proteins, as has the conserved domains 6, 7 and 8; several of these other proteins have helper or stabilizer function, and Rosso teaches that coexpression increases toxicity (response pg 17-18).

This is not found persuasive. The specification does not teach how to assay SEQ ID NO:7 or the claimed variants or how to make them. Rosso does not make up for this deficiency.

5. Claims 1-11, 19 and 22-36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The rejection is repeated for the reasons of record as set forth in the Office action mailed 5 April 2007. Applicant's arguments filed 2 July 2007 have been fully considered but they are not persuasive.

A full review of the specification indicates that nucleic acids encoding a pesticidal protein with 95% identity to SEQ ID NO:3, 5 or 7 and nucleic acids with 95% identity to SEQ ID NO:1, 2, 4 or 6, wherein the nucleic acid encodes a pesticidal protein are essential to the operation of the claimed invention. As nucleic acids encoding proteins with 95% identity to SEQ ID NO:3, 5 or 7 would encode proteins with 35 amino acid substitutions and nucleic acids with 95% identity to SEQ ID NO:1 encompass those that encode proteins with 299 amino acid substitutions relative to SEQ ID NO:3, 5 or 7, the claims are drawn to a broad genus of nucleic acids. The level of skill and knowledge in the art at the time of filing was such that no other proteins within the scope of the claims were known

The specification describes no relevant characteristics or motifs for the claimed nucleic acids other than identity to SEQ ID NO:1, 2, 4 or 6. At the time of filing it was known that each *cry* protein only has activity against one or few insect species (de Maagd et al, 1999, Appl. Environ. Microbiol. 65:4369-4374, see pg 4369, column 1, paragraph 1) and that even a single amino acid substitution in a *cry* protein may alter its insecticidal specificity (Tounsi et al, 2003, J. Appl. Microbiol. 95:23-28; see pg 27, column 2, paragraph 2), but the relationship between structure and pesticidal function was not known. Furthermore, the specification does not describe the structure required for the recited function, nor does it describe the structural features that distinguish pesticidal protein-encoding nucleic acids with 95% identity to SEQ ID NO:1, 2, 4 or 6 from other nucleic acids with 95% identity to SEQ ID NO:1, 2, 4 or 6 or pesticidal proteins with 95% identity to SEQ ID NO:3, 5 or 7 from other proteins with 95% identity to SEQ ID NO:3, 5 or 7.

The only species reduced to practice in the specification is SEQ ID NO:1, 2, 4 or 6,

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which encodes SEQ ID NO:3, 5 or 7. Since the disclosure fails to describe the common attributes that identify members of the genus, and because the genus is highly variant, SEQ ID NO:1, 2, 4 or 6 alone is insufficient to describe the claimed genus.

Additionally, the only function assigned to SEQID NO:7 is “delta-endotoxin associated protein. The reference s that known proteins with identity to SEQ ID NO:7 “share homology to the C-terminal non-toxic domain of *cry4Aa* and *cry4Ba*” (pg 38, lines 9-10) suggests SEQ ID NO:7 is not a toxin. No actual function is described.

Hence, Applicant has not, in fact, described nucleic acids encoding a pesticidal protein with 95% identity to SEQ ID NO:3, 5 or 7 and nucleic acids with 95% identity to SEQ ID NO:1, 2, 4 or 6, wherein the nucleic acid encodes a pesticidal protein, within the full scope of the claims, and the specification fails to provide an adequate written description of the claimed invention.

Therefore, given the lack of written description in the specification with regard to the structural and functional characteristics of the claimed compositions, it is not clear that Applicant was in possession of the claimed genus at the time this application was filed.

Applicant urges that the Written Description Guidelines, *Lilly* and *Enzo* state that written description requires a precise definition by structure, which is present in the 90% identity recitation (response pg 17-18).

This is not found persuasive. The portion of *Enzo* quoted by Applicant states: “the written description requirement would be met ... if the functional characteristics of [a genus of polypeptides] were coupled with a disclosed correlation between that function and a structure

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that is sufficiently known or disclosed.” Aaronson et al, de Maagd et al, 1999, and de Maagd et al, 2001, make it clear that the correlation between that function and a structure is not sufficiently known in cry proteins as a whole, and the specification does not describe the motifs and amino acids required for SEQ ID NO:3, 5 or 7 biological activity.

Applicant urges that methods of assaying a determining percent identity are known in the art and taught in the specification; further numerous other endotoxins are known in the art, and their structures studied (response pg 18).

This is not found persuasive because none of these describe the structure of nucleic acids encoding pesticidal proteins with 208 or 598 amino acid substitutions relative to SEQ ID NO:3 or 168 substitutions in SEQ ID NO:7.

Applicant urges that Li teaches the three-domain structure of delta-endotoxins, which provides specific structural parameters; thus, recitation of a percent identity provides defined structural parameters of the claimed sequences (response pg 18-19).

This is not found persuasive because this recitation does not describe the structural features responsible for the claimed function. The three domain structure applies to any endotoxin, and does not describe any structure specific to SEQ ID NO:3 or 5 function or any structure or function of SEQ ID NO:7.

Applicant urges that relevant motifs were disclosed - Li teaches the 3-domain structure, each with specific functions, and conserved regions were disclosed; the 3 domain structure is generic to all delta-endotoxins and the 5 blocks are highly conserved throughout all delta-endotoxins (response pg 19).

This is not found persuasive. de Maagd et al, 1999, teach that that the crystal structure of

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Cry1C only allows for limited prediction of the structure of Cry1Aa (pg 4373, right column, paragraph 4); thus, Li's teaching is clearly insufficient for describing the structure/function relationship of the claimed nucleic acids.

Applicant urges that a description of a representative number of species does not require individual support for each species in the genus; the representative number depends on whether one of skill in the art would recognize that Applicant was in possession of the genus; because an exemplary sequence was disclosed and because numerous delta-endotoxins were known in the art, one of skill in the art could envision the claimed invention (response pg 19-20).

This is not found persuasive. While individual support for each species is not required, support for a representative number of species is required. The specification does not describe the structure of a single nucleic acid encoding a pesticidal protein with up to 598 amino acid substitutions relative to SEQ ID NO:3 or 168 substitutions relative to SEQ ID NO:7.

Applicant urges that the recitation of a predictable structure is sufficient to satisfy the written description requirement (response pg 20).

This is not found persuasive because the correlation between structure and function is also required, but not provided by the instant specification. The relationship between structure and pesticidal function was not described in the specification.

See *Ex parte Kubin*, 83 USPQ2d 1410 (Bd. Pat. App. & Int. 2007) at pg 1417:

[Appellants] ... have not described what domains of those sequences are correlated with the required binding to CD48, and thus have not described which of NAIL's amino acids can be varied and still maintain binding. Thus, under Lilly and its progeny, their Specification would not have shown possession of a sufficient number of sequences falling within their potentially large genus to establish possession of their claimed genus. Cf. *Enzo*, 323 F.3d at 964, 63 USPQ2d at 1612 ("if the functional characteristic of ... binding to [CD48] were coupled with a disclosed correlation between that function and a structure that is sufficiently known or disclosed," the written description requirement may be met).

Without a correlation between structure and function, the claim does little more than define the claimed invention by function. That is not sufficient to satisfy the written description requirement. See *Eli Lilly*, 119 F.3d at 1568,

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43 USPQ2d at 1406 (“definition by function ... does not suffice to define the genus because it is only an indication of what the gene does, rather than what it is”).

Applicant urges that the functional limitation distinguishes the claimed genus, and the specification and art provide assays, and methods for generating variants and fragments (response pg 20-21).

This is not found persuasive. The specification does not describe the structure required for the recited function, nor does it describe the structural features that distinguish pesticidal protein-encoding nucleic acids with 90% identity to SEQ ID NO:1, 2, 4 or 6 from other nucleic acids with 90% identity to SEQ ID NO:1, 2, 4 or 6, pesticidal protein-encoding nucleic acids with 90% identity to SEQ ID NO:3 or 5 from other nucleic acids with 90% identity to SEQ ID NO:3 or 5, or delta-endotoxin associated protein-encoding nucleic acids with 90% identity to SEQ ID NO:7 from other nucleic acids with 90% identity to SEQ ID NO:7.

Applicant urges that the function of delta-endotoxin associated proteins have been described in the art, and the specification cites references where the function is assayed, citing Park and Ge (response pg 21).

This is not found persuasive. Park and Ge are drawn to an upstream sequences of Cry3A, Cry2A and cry 11A, which have no similarity to SEQ ID NO:7. The statement that SEQ ID NO:7 “share[s] homology to the C-terminal non-toxic domain of *cry4Aa* and *cry4Ba*” (pg 38, lines 9-10) suggests SEQ ID NO:7 is not a toxin.

Conclusion

6. No claim is allowed.
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anne R. Kubelik, whose telephone number is (571) 272-0801.

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The examiner can normally be reached Monday through Friday, 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anne Marie Grunberg, can be reached at (571) 272-0975.

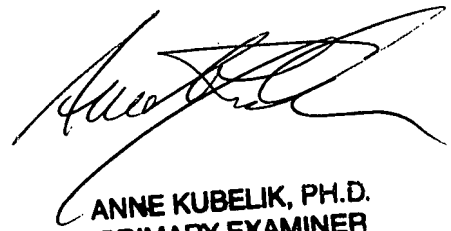
The central fax number for official correspondence is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to (571) 272-0547.

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Anne Kubelik, Ph.D.
September 11, 2007



**ANNE KUBELIK, PH.D.
PRIMARY EXAMINER**